



Applications for Autofocusing Autocollimator

Our Autofocusing Autocollimator is characterized by its capability to focus along its propagation axis at different distances via a motorized system which is controlled by a software specially adapted and activated through a PC. The following applications are common:

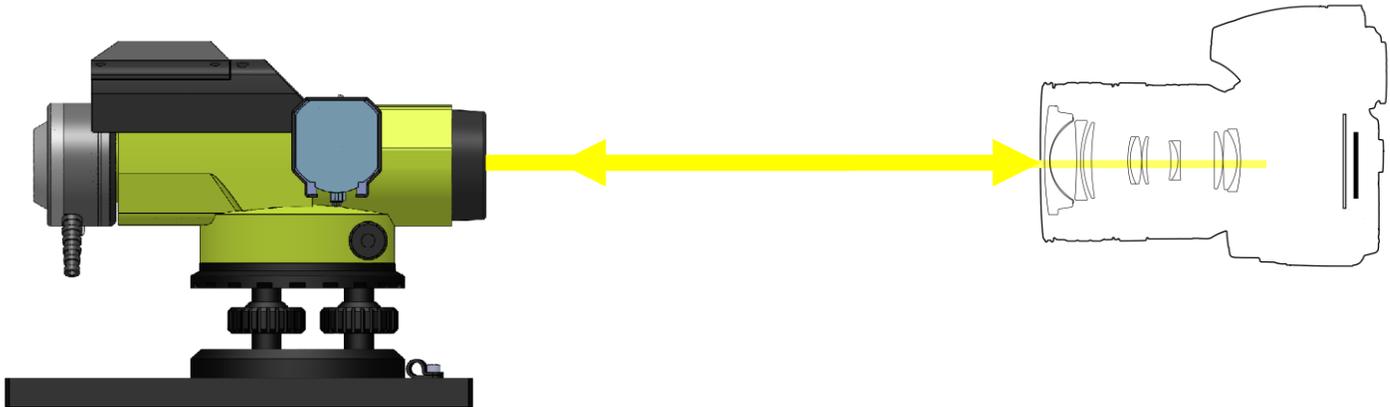
1. Optical applications:
 - 1.1 Testing of camera objectives
 - 1.2 Testing distance of reflective surfaces (such as silicon wafers)
 - 1.3 Radius Measurement of Concave & Convex Spherical Surfaces
 - 1.4 Measurement of the Back Focal of Lenses and Optical Systems

2. LED & LD focusing applications:
 - 2.1 Adjustment of LD position to represent a certain illumination distance.
 - 2.2 Adjustment of a laser diode to best collimating position
 - 2.3 Calculating beam divergence by a dedicated software addition



1.1 Testing of Camera Objectives

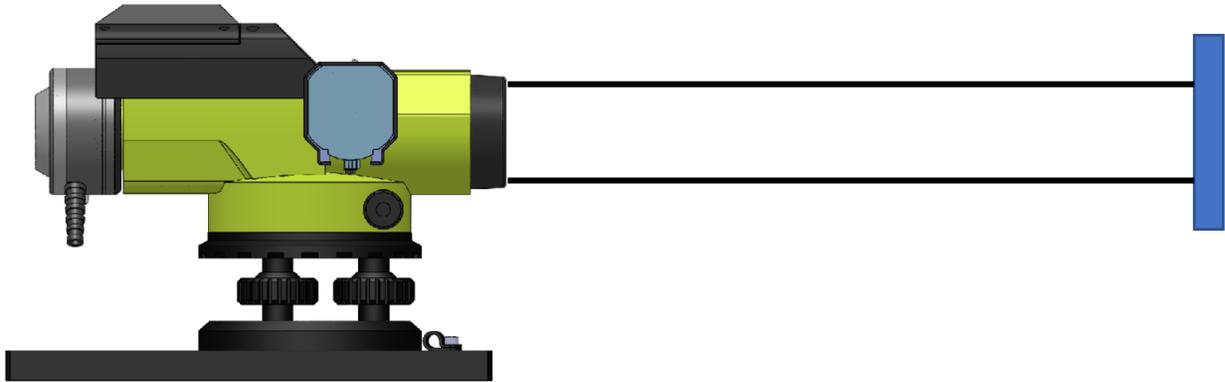
Place a mirror or other reflective surface into the image plane of the objective. By changing the focusing distance of the Autocollimator, you can check your lens' focus ring position compared with actual distance.





1.2 Testing distance of reflective surfaces

Place a silicon wafer in front of the Autocollimator, change the projected cross position distance until you get a sharp return image. Software will clearly display the distance of your reflecting part (silicon) from the Autocollimator reference plane.





1.3.1 Radius Measurement of Concave Spherical Surfaces

This method will measure a front surface curvature of a negative optical system as per attached drawings.

The measurement is done as follows:

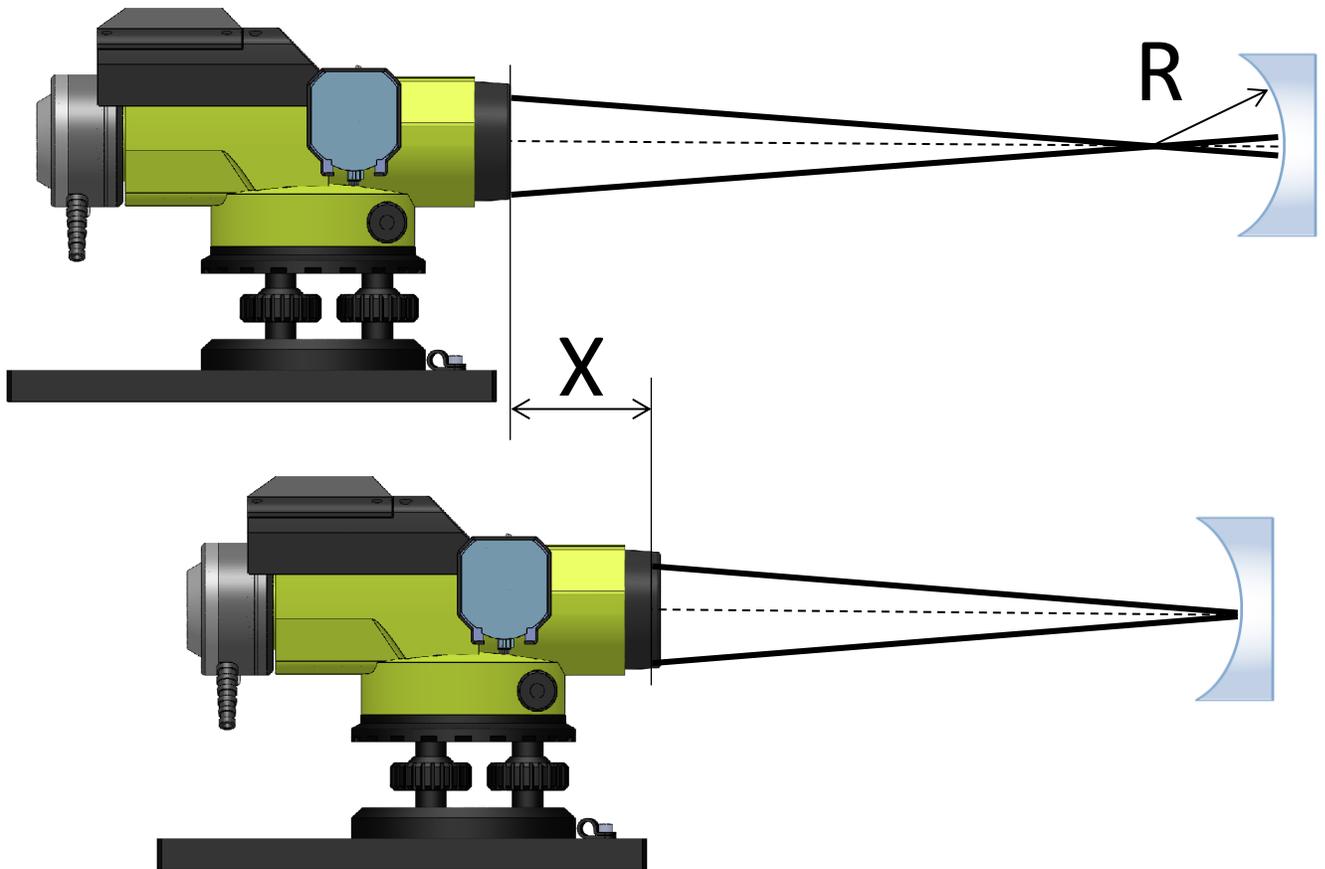
- a) Move the autocollimator along the translation slide until a sharp image occurs.
- b) Move the autocollimator to the next position until the image is sharp. The difference of position between the two locations will give the radius of curvature.

$$R = X$$

Where:

R: Radius of the surface

X: Distance between the autocollimation images





1.3.2 Radius Measurement of Convex Spherical Surfaces

- a) Move the autocollimator along the translation slide until a sharp image occurs.
- b) Move the autocollimator to the next position until the image is sharp. The difference of position between two locations will give the radius of curvature.

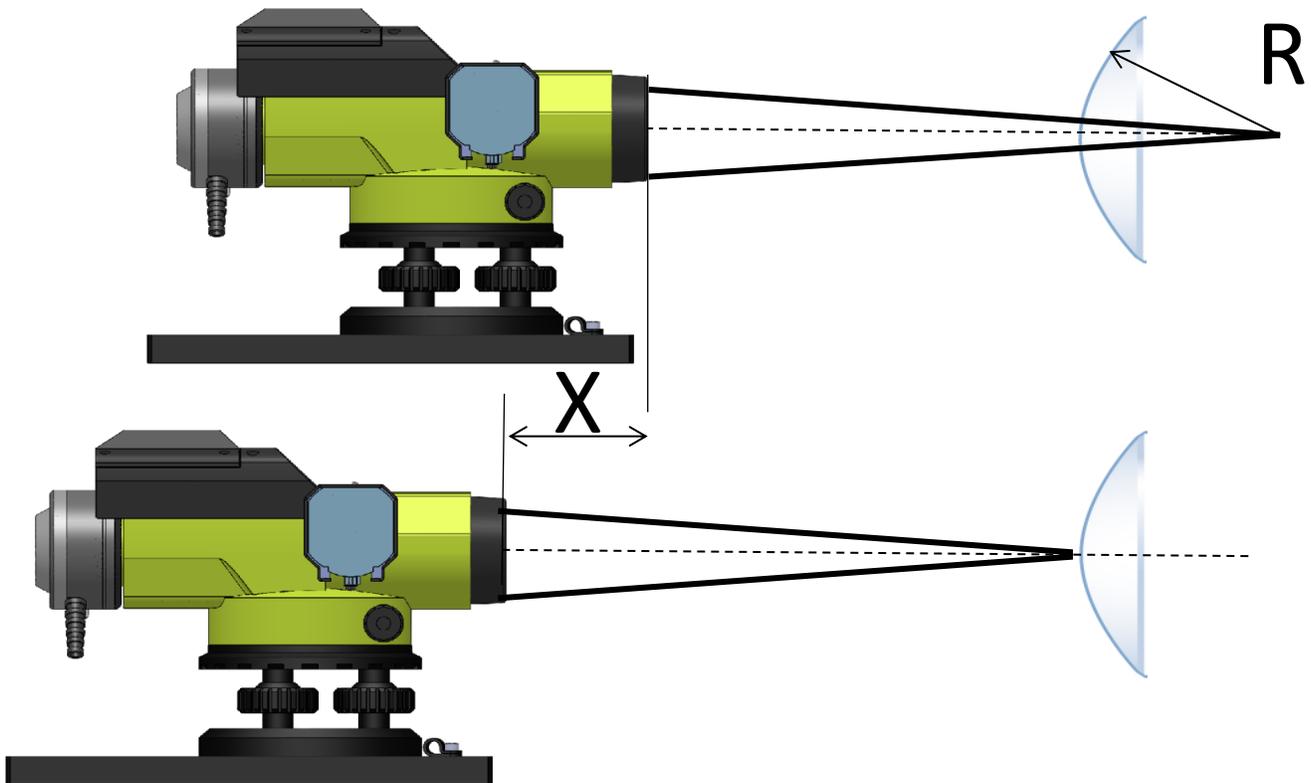
$$R = X$$

Where:

R: Radius of the surface

X: Distance between the autocollimation images

When measuring transparent lenses additionally autocollimation images from the lower surfaces occur. That has to be taken in mind when selecting the corresponding pictures for radius measurement.





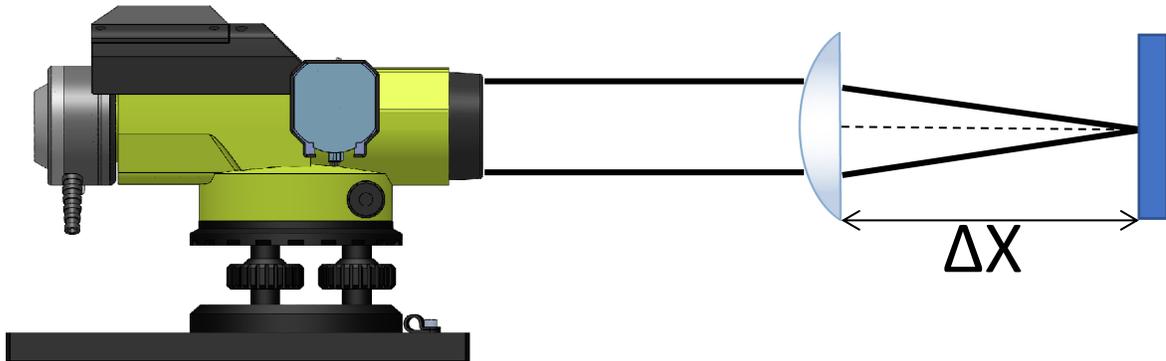
1.4 Measurement of the Back Focal of Lenses and Optical Systems

Measurement of back focal length is performed by finding the focal position and then measuring distance between focal position and the rear part of the lens.

The setup includes the lens under test, our Autocollimator and a mirror.

Place the lens in front of the Autocollimator, and move the mirror back and forth as shown in the drawing. Once you get a clear return of the cross on your Autocollimator system, it means that the mirror is exactly positioned at the focal point of your lens.

Perform ΔX measurements, which is the distance between the mirror and the lens under test, and this coincides with the back focal lens.





2.1 Adjustment of LD position to represent a certain illumination distance.

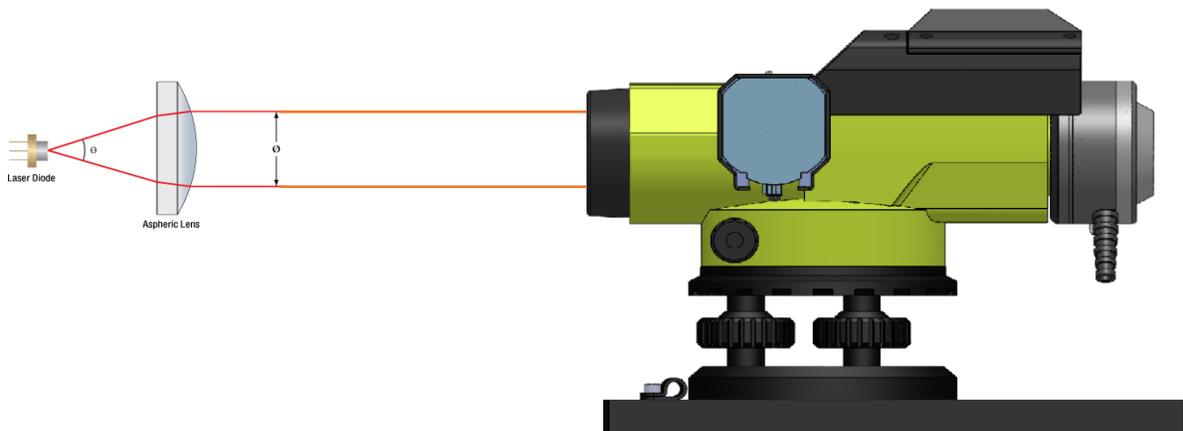
Using our Autofocusing Electronic Autocollimator, one can adjust a Laser Diode collimated system to project its beam to a certain distance. In order to do that, you adjust the Autocollimator using its built-in motor to be focused to the required distance.

The screenshot displays the software interface for the AutoFocusing Electronic Autocollimator. The main window is titled "AutoFocusing EAC - AutoCollimator mode [DOU3-001M]". It features a toolbar at the top with various icons for file operations, settings, and control. The central area is an "Image Display" showing a crosshair with a blue vertical line and a yellow horizontal line, both labeled "0.0 (mrad)".

On the right side, there are several data panels:

- Cursor (mrad):** Shows $\theta_X = 1.41176$, $\theta_Y = 1.36308$, and $\theta_R = 1.96241$.
- Angle (mrad):** Shows $\theta_X = 0.53082$, $\theta_Y = 0.49081$, and $\theta_R = 0.72295$.
- Rotation ($^\circ$):** Shows a value of 0.184 .
- Center (mrad):** Shows $\theta_X = 0.00000$ and $\theta_Y = 0.00000$.
- Autocollimator Control (Distance):** Shows a distance of 440.9 mm with "Stop", "Reset", and "Infinity" buttons, and a "Step" of 0.225° .

At the bottom, a "Status bar" displays system information: "9/3/2019 12:18:15 PM", "Average: Off", "Zoom x 1", "30 fps", "10 bpp", and "Mode: AutoCollimator".



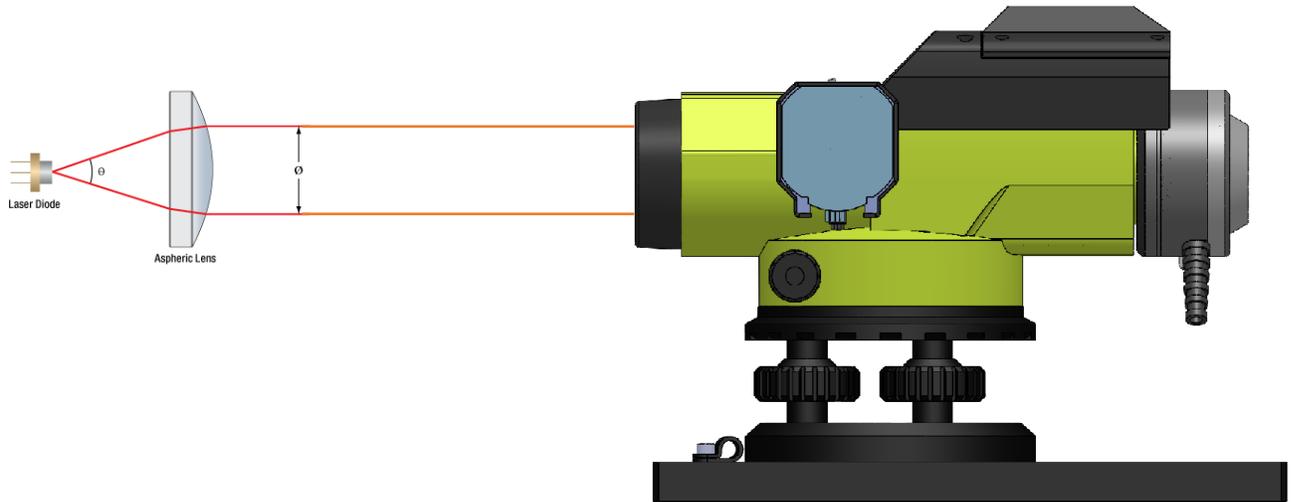


Then, place your collimated LD in front of the Autocollimator and move the collimating lens of the LD until you get the best image reflected from the LD front surface. This will ensure that your LD system is focusing its beam to a certain distance.



2.2 Adjustment of a laser diode to best collimating position

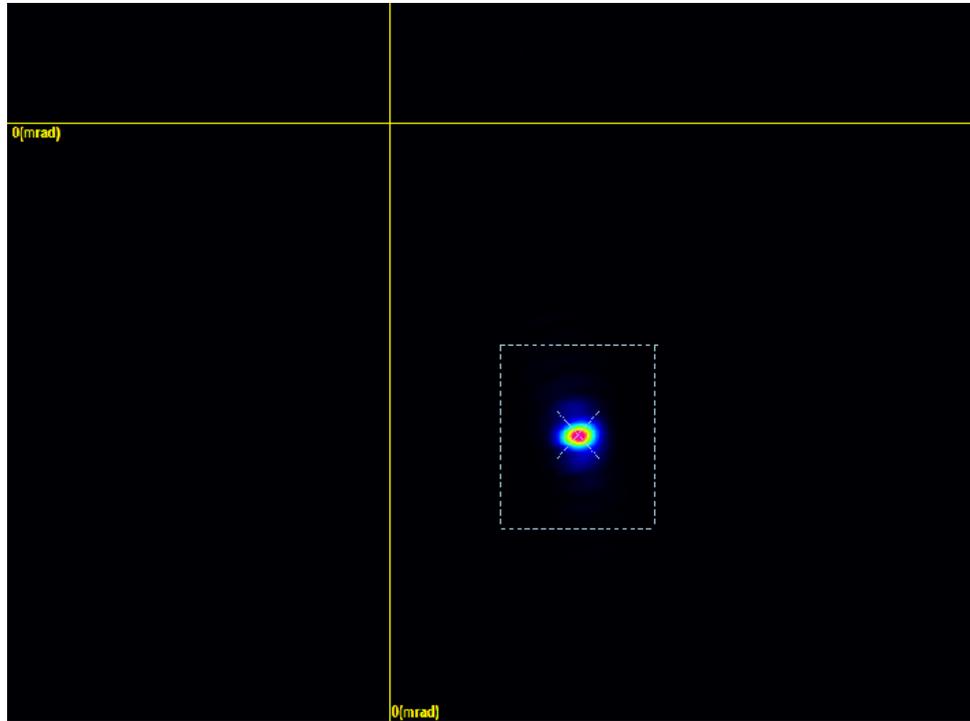
For performing this application, adjust your Autocollimator to the infinity position and perform a similar setup as described in 2.1, this will ensure your laser diode is well collimated.





2.3 Calculating beam divergence by a dedicated software addition

By adjusting your Autocollimator to infinity and projecting a beam into its input aperture, one can measure the beam divergence angle. The divergence angle is simply the beam size as observed by the dedicated profiling software, and the result will be displayed as angular propagation.



Data (mrad)		
	Horizontal	Vertical
Angle	-0.858	0.562
Width 80.0%	0.077	0.000
Width 50.0%	0.268	0.000
Width 32.3%	0.586	0.000
Best Fit		
Width 80.0%	6.175	3.828
Width 50.0%	10.88	6.746
Width 32.3%	13.90	8.614
Correlation	58.73	51.75

Beam Analysis Mode

Angle (mrad)		Cursor (mrad)	
$\tilde{\theta}_x$	1.20676	$\tilde{\theta}_x$	0.20619
$\tilde{\theta}_y$	-1.47760	$\tilde{\theta}_y$	-0.37981
$\tilde{\theta}_R$	1.90776	$\tilde{\theta}_R$	0.43217
Rotation (°)		Rotate (°)	
$\tilde{\theta}_R$	-0.032	$\tilde{\theta}_R$	0.1
Center (mrad)			
θ_x	0.02170	Catch	
θ_y	-0.04341	Reset	

AutoCollimator Mode